present invention has an object of providing a membrane-electrode assembly for fuel cell having a lower internal resistivity than ever.

Further, taking into account said problems, the present invention has an object of providing a membrane-electrode assembly for fuel cell, a method of producing a membrane-electrode assembly for fuel cell, a polymer electrolyte coating compound for fuel cell and a polymer electrolyte type fuel cell which undergoes no great cracking on the surface of a catalyst layer which is an uppermost layer and hence no deterioration of cell discharge rate or cycle life.

In order to solve the above-described problems, the first present invention concerns a method of producing a membrane-electrode assembly for fuel cell comprising:

a first catalyst layer forming step of spreading a first coating compound over a running substrate to form a first catalyst layer;

an electrolyte forming step of spreading a second coating compound over said first catalyst layer while said first catalyst layer is wet to form an electrolyte layer;

a drying step of drying said electrolyte layer; and

a second catalyst layer forming step of spreading a third coating compound over said dried electrolyte layer

to form a second catalyst layer, wherein said first catalyst layer and said second catalyst layer are a hydrogen electrode and an oxygen electrode, respectively, or an oxygen electrode and a hydrogen electrode, respectively.

Further, the second present invention concerns the method of producing a membrane-electrode assembly for fuel cell as described in the first present invention, wherein said drying step is effected at a drying temperature of from not lower than 20°C to not higher than 150°C.

Further, the third present invention concerns the method of producing a membrane-electrode assembly for fuel cell as described in the first or second present invention, wherein said drying step is effected with the distance between the outlet of hot air and said electrolyte layer falling within the range of from not smaller than 10 mm to not greater than 500 mm.

Further, the fourth present invention concerns the method of producing a membrane-electrode assembly for fuel cell as described in Claim 3, wherein said drying step is effected with the hot air flow rate at a position of 10 mm from said outlet of hot air falling within the range of from not smaller than 1 m per second to not greater than 20 m per second.

Further, the fifth present invention concerns an apparatus of producing a membrane-electrode assembly for fuel cell comprising:

a first catalyst layer forming unit of spreading a first coating compound over a running substrate to form a first catalyst layer;

an electrolyte forming unit of spreading a second coating compound over said first catalyst layer thus formed while said first catalyst layer is wet to form an electrolyte layer;

a drying unit of drying said electrolyte layer; and

a second catalyst layer forming unit of spreading a third coating compound over said dried electrolyte layer to form a second catalyst layer,

wherein said first catalyst layer and said second catalyst layer are a hydrogen electrode and an oxygen electrode, respectively, or an oxygen electrode and a hydrogen electrode, respectively.

Further, the sixth present invention concerns a membrane-electrode assembly for fuel cell comprising:

a hydrogen electrode;

an electrolyte layer formed on said hydrogen electrode; and

an oxygen electrode formed on said electrolyte layer,

Claims

1. A method of producing a membrane-electrode assembly for fuel cell comprising:

a first catalyst layer forming step of spreading a first coating compound over a running substrate to form a first catalyst layer;

an electrolyte forming step of spreading a second coating compound over said first catalyst layer while said first catalyst layer is wet to form an electrolyte layer;

a drying step of drying said electrolyte layer; and

a second catalyst layer forming step of spreading a third coating compound over said dried electrolyte layer to form a second catalyst layer, wherein said first catalyst layer and said second catalyst layer are a hydrogen electrode and an oxygen electrode, respectively, or an oxygen electrode and a hydrogen electrode, respectively.

2. The method of producing a membrane-electrode assembly for fuel cell as described in Claim 1, wherein said drying step is effected at a drying temperature of from not lower than 20°C to not higher than 150°C.

3. The method of producing a membrane-electrode assembly for fuel cell as described in Claim 1 or 2, wherein said drying step is effected with the distance between

the outlet of hot air and said electrolyte layer falling within the range of from not smaller than 10 mm to not greater than 500 mm.

4. The method of producing a membrane-electrode assembly for fuel cell as described in Claim 3, wherein said drying step is effected with the hot air flow rate at a position of 10 mm from said outlet of hot air falling within the range of from not smaller than 1 m per second to not greater than 20 m per second.

Claims

1. (Amended) A method of producing a membrane-electrode assembly for fuel cell comprising:

a first catalyst layer forming step of spreading a first coating compound over a running substrate to form a first catalyst layer;

an electrolyte forming step of spreading a second coating compound over said first catalyst layer while said first catalyst layer is wet to form an electrolyte layer;

a drying step of drying said electrolyte layer such that the thickness of said electrolyte layer kept in wet state reaches a predetermined value; and

a second catalyst layer forming step of spreading a third coating compound over said dried electrolyte layer to form a second catalyst layer, wherein said first catalyst layer and said second catalyst layer are a hydrogen electrode and an oxygen electrode, respectively, or an oxygen electrode and a hydrogen electrode, respectively.

2. The method of producing a membrane-electrode assembly for fuel cell as described in Claim 1, wherein said drying step is effected at a drying temperature of from not lower than 20°C to not higher than 150°C.

3. The method of producing a membrane-electrode assembly for fuel cell as described in Claim 1 or 2, wherein said drying step is effected with the distance between

the outlet of hot air and said electrolyte layer falling within the range of from not smaller than 10 mm to not greater than 500 mm.

4. The method of producing a membrane-electrode assembly for fuel cell as described in Claim 3, wherein said drying step is effected with the hot air flow rate at a position of 10 mm from said outlet of hot air falling within the range of from not smaller than 1 m per second to not greater than 20 m per second.